

## **An Overview of the Standards for Mathematical Practices for Elementary Teachers**

### **1 Make sense of problems and persevere in solving them.**

Students develop a “stick with it” attitude when solving problems including tasks that do not have an obvious solution. Multiple entrance points to a problem may exist and students may engage in various strategies including the use of visual models, drawings and manipulatives in order to make sense of the mathematics they are trying to learn. Solving a simpler problem may help unlock the reasoning skills necessary for students to begin work on a more complex task.

### **2 Reason abstractly and quantitatively.**

Real-world problems engage students and develop reasoning skills by providing a context for mathematics. Students are able to represent a problem in a variety of ways to best fit a given situation. Students are flexible in their thinking, using properties of numbers as well as problem-solving strategies to move between concrete, abstract and symbolic representations.

### **3 Construct viable arguments and critique the reasoning of others.**

Students need to be able to explain and justify their solutions strategies to an audience of their peers. They may use objects, drawings, diagrams, and/or actions when presenting. Listening to other ideas help students build deeper understandings of the mathematics being discussed by refining and improving their own strategies.

### **4 Model with mathematics.**

Using mathematics in real-world contexts helps students become mathematically proficient. Models may include drawings, equations, graphs, diagrams or manipulatives. Students will choose more sophisticated and efficient models as they progress in their conceptual understanding of mathematics. They will be able to analyze relationships to draw conclusions. As students interpret results, they will check to see if those results make sense.

### **5 Use appropriate tools strategically.**

Students have a wealth of tools at their disposal to use in mathematics from paper and pencil to computer software. Knowing which tool to use and when it is most appropriate for a given situation helps students explore and deepen their conceptual understanding.

### **6 Attend to precision.**

Having the appropriate mathematical vocabulary helps students become more precise when communicating with others. Care is taken to ensure accurate calculations and correct labels as necessary.

### **7 Look for and make use of structure.**

Recognizing and building on patterns in mathematics enhances students’ ability to understand and extend conceptual understanding. Examples of patterns are found throughout mathematics. Developing reasoning skills related to finding patterns will help students make connections when more complex mathematics is encountered.

### **8 Look for and express regularity in repeated reasoning.**

Students should look for consistency in mathematics whether performing simple calculations or attempting more complex problems. A specific calculation always has the same result yet can be understood from recalling a similar problem or algorithm.

### Questions to Ask Centering on the Standards for Mathematical Practices:

Ask:	Mathematical Practice:
<ul style="list-style-type: none"> <li>• What is the problem asking?</li> <li>• Does your answer make sense?</li> <li>• Have you worked a problem similar to this?</li> <li>• How will you use the information provided?</li> <li>• Is there another way to solve the problem?</li> <li>• What did you do first? Why?</li> </ul>	<p style="text-align: center;"><b>Make sense of problems and persevere in solving them.</b></p>
<ul style="list-style-type: none"> <li>• How can you represent the problem?</li> <li>• What equation is represented in this situation?</li> <li>• Why did you choose this operation?</li> <li>• Is there another way of solving this problem?</li> <li>• What properties did you use?</li> <li>• Is your answer reasonable? How do you know?</li> </ul>	<p style="text-align: center;"><b>Reason abstractly and quantitatively.</b></p>
<ul style="list-style-type: none"> <li>• Will your strategy always work? How do you know?</li> <li>• Based on what he/she said, do you agree or disagree? Explain your thinking.</li> <li>• What will happen if ...?</li> <li>• What do you want to ask him/her about the way they solved the problem?</li> <li>• How does your drawing/diagram/graph support your answer?</li> </ul>	<p style="text-align: center;"><b>Construct viable arguments and critique the reasoning of others.</b></p>
<ul style="list-style-type: none"> <li>• What is a good representation for this problem?</li> <li>• How can you use a simpler/similar problem to help you find the answer?</li> <li>• What conclusions can you draw from your answer?</li> <li>• What changes to your model would you make if ...?</li> </ul>	<p style="text-align: center;"><b>Model with mathematics.</b></p>
<ul style="list-style-type: none"> <li>• What could you use to help you solve the problem?</li> <li>• What strategy might you use to make the problem easier?</li> <li>• Would estimation help you? How?</li> <li>• Why did you decide to use ...?</li> </ul>	<p style="text-align: center;"><b>Use appropriate tools strategically.</b></p>
<ul style="list-style-type: none"> <li>• Is your answer reasonable? How do you know?</li> <li>• Explain your answer using appropriate mathematical vocabulary.</li> <li>• What do you mean?</li> <li>• How do you know that the answers you gave are equivalent?</li> </ul>	<p style="text-align: center;"><b>Attend to precision</b></p>
<ul style="list-style-type: none"> <li>• What is the pattern? How did you find that?</li> <li>• Are there any other patterns you can find? Explain.</li> <li>• What is the rule? Why?</li> <li>• How does the property you used work?</li> <li>• How is that like ...?</li> </ul>	<p style="text-align: center;"><b>Look for and make use of structure.</b></p>
<ul style="list-style-type: none"> <li>• What would happen if ...?</li> <li>• What if you ... instead of ...?</li> <li>• Is there a relationship between what you did and ...?</li> <li>• What connections did you make?</li> <li>• Using your prior knowledge, what do you remember about ...?</li> </ul>	<p style="text-align: center;"><b>Look for and express regularity in repeated reasoning.</b></p>

Adapted by: Barb Weidus, Curriculum Alignment Specialists & Catherine Schulte, Clermont Ct. ESC